del 4, 15 and 8,

$$\sum_{l=1}^{N} \omega_{lk} = \gamma_k, \ 1 \le k \le K, \text{ and}$$

$$\sum_{k=1}^{K} \omega_{lk} = \mu_l, \ 1 \le i \le N.$$

14. The method according to claim 13 wherein at least one of said first and second mixture probability distribution functions includes a Gaussian Mixture Model.

15. The method according to claim 13 wherein the element distance between the first and second probability distance functions includes Kullback Leibler Distance.

16. The method of claim 13 wherein the first and second probability distribution functions are Gaussian mixture models derived from audio segments.

REMARKS

The Office Action Summary page indicates that all claims are allowed but that, alas, is in error.

Claims 1-16 were rejected under 35 USC 101. Applicants' representative spoke with Examiner Desta on February 4, 2003, and the amendments to the claims are reflective of the discussion relative to 35 USC 101. It is respectfully submitted that the amended claims are clearly statutory.

Claims 1-16 were also rejected under 35 USC 102 as being anticipated by Beigi et al, US Patent 6,246,982. Applicants respectfully traverse.

The Beigi et al reference computes the distance between collections of distributions. However, the distance measure that Beigi et al employ is defined by their equation (6), and that is:

$$D_{AB} = \frac{\sum_{i=1}^{M} W_i^A + \sum_{j=1}^{N} W_j^B}{\sum_{i=1}^{M} c_i^A + \sum_{j=1}^{N} c_j^B}.$$

The term W_i^A corresponds to a weighted minima row, and the term W_j^B corresponds to a weighted minima column. As stated in col. 5, lines 64 et seq. of the reference,

> The minimum distance is multiplied by the counts (number of [samples] spectral components) for the clusters corresponding to the A n-dimensional distributions to arrive at the weighted row minima W_i^A for row i (i=1 to M).

Clearly, the distance measure of Beigi et al is not the same as the distance measure defined in independent claims 1, 5, 9, and 13. Therefore, the independent claims are not anticipated by the Beigi et al reference and, consequently, the dependent claims are also not anticipated by the Beigi et al reference.

In light of the above amendments are remarks, applicants respectfully submit that all of the Examiner's rejections have been overcome. Reconsideration and allowance of the outstanding claims are respectfully solicited.

Respectfully,
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Dated: 2/4/03

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Appendix – Marked Up Version sh wing Changes Made

IN THE CLAIMS:

1. A method executed in a computer of computing a distance measure between first and second mixture type probability distribution functions, $G(x)=\sum_{i=1}^{N}\mu_i g_i(x)$, and $H(x)=\sum_{k=1}^{K}\gamma_k h_k(x)$, pertaining to audio data, the improvement characterized by [comprising the step of]:

[evaluating] said distance measure being [the equation:]

$$D_M(G,H)=\min_{w=[\omega_{ik}]}\sum_{i=1}^{N}\sum_{k=1}^{K}\omega_{ik}d(g_i,h_k),$$

where $d(g_i, h_k)$ is a function of the distance between a component, g_i, of the first probability distribution function and a component, h_k, of the second probability distribution function where

$$\sum_{i=1}^{N}\mu_i=1 \ \ and \ \sum_{k=1}^{K}\gamma_k=1\,[.],$$

and

$$\omega_{ik}\geq 0,\ 1\leq i\leq N,\ 1\leq k\leq K,$$

and

$$\sum_{k=1}^{K}\omega_{ik}=\mu_i,\ 1\leq i\leq N,\ \sum_{i=1}^{N}\omega_{ik}=\gamma_k,\ 1\leq k\leq K.$$

2. The method according to claim 1 wherein at least one of said first and second mixture probability distribution functions includes a Gaussian Mixture Model.

3. The method according to claim 1 wherein the element distance between the first and second probability distance functions [includes] is a Kullback Leibler Distance.

4. The method of claim 1 wherein the first and second probability distribution functions are Gaussian mixture models derived from audio segments.

5. A computer program embedded in a storage medium for computing a distance measure between first and second mixture type probability distribution functions, $G(x) = \sum_{i=1}^{N} \mu_i g_i(x)$, and $H(x) = \sum_{k=1}^{K} \gamma_k h_k(x)$, pertaining to audio data, the improvement comprising a software module that evaluates said distance measure in accordance with [the] equation:

$$D_M(G,H) = \min_{w=[\omega_{ik}]} \sum_{i=1}^{N} \sum_{k=1}^{K} \omega_{ik} d(g_i, h_k),$$

where $d(g_i, h_k)$ is a function of [the] distance between a component, g_i, of the first probability distribution function and a component, h_k, of the second probability distribution function

where

$$\sum_{i=1}^{N} \mu_i = 1 \ \ and \ \sum_{k=1}^{K} \gamma_k = 1 [.],$$

and

$$\omega_{ik} \geq 0, \ 1 \leq i \leq N, 1 \leq k \leq K,$$

and

$$\sum_{k=1}^{K} \omega_{ik} = \mu_i, 1 \leq i \leq N, \sum_{i=1}^{N} \omega_{ik} = \gamma_k, 1 \leq k \leq K.$$

6. The computer program according to claim 5 wherein at least one of said first and second mixture probability distribution functions includes a Gaussian Mixture Model.

7. The computer program according to claim 5 wherein the element distance between the first and second probability distance functions includes Kullback Leibler Distance.

8. The computer program of claim 5 wherein the first and second probability distribution functions are Gaussian mixture models derived from audio segments.

9. A computer system for computing a distance measure between first and second mixture type probability distribution functions, $G(x)=\sum_{i=1}^{N}\mu_i g_i(x)$, and $H(x)=\sum_{k=1}^{K}\gamma_k h_k(x)$, pertaining to audio data comprising:

memory for storing said audio data;

a processing module for deriving one of said mixture type probability distribution functions from said audio data; and

a processing module for evaluating said distance measure in accordance with [the equation:]

$$D_M(G,H)=\min_{w=[\omega_{ik}]}\sum_{i=1}^{N}\sum_{k=1}^{K}\omega_{ik}d(g_i,h_k),$$

where $d(g_i, h_k)$ is a function of the distance between a component, g_i, of the first probability distribution function and a component, h_k, of the second probability distribution function,

where

$$\sum_{i=1}^{N}\mu_i=1 \ \ and \ \sum_{k=1}^{K}\gamma_k=1\,[.],$$

and

$$\omega_{ik}\geq 0,\ 1\leq i\leq N, 1\leq k\leq K,$$

and

$$\sum_{k=1}^{K}\omega_{ik}=\mu_i, 1\leq i\leq N, \sum_{i=1}^{N}\omega_{ik}=\gamma_k, 1\leq k\leq K.$$

10. The computer system according to claim 9 wherein at least one of said first and second mixture probability distribution functions includes a Gaussian Mixture Model.

11. The computer system according to claim 9 wherein the element distance between the first and second probability distance functions includes Kullback Leibler Distance.

12. The computer system of claim 9 wherein the first and second probability distribution functions are Gaussian mixture models derived from audio segments.

13. A method for computing a distance measure between [first and second] a mixture type probability distribution function[s G and H, wherein:] $G(x)=\sum_{i=1}^{N}\mu_i g_i(x)$, where[in] μ_i is a weight imposed on [a] component, $g_i(x)$, [of the first] and a mixture type probability distribution function [and] $H(x)=\sum_{k=1}^{K}\gamma_k h_k(x)$, where[in] γ_k is a weight imposed on [a] component h_k [, of the second probability distribution function] comprising the steps of:

computing an element distance, $d(g_i, h_k)$, between each g_i and each h_k where $1 \le i \le N, 1 \le k \le K$,

computing an overall distance, denoted by $D_M(G,H)$, between the [first] mixture probability distribution function[,] G, and the [second] mixture probability distribution function[,] H, based on a weighted sum of the all element distances,

$$\sum_{i=1}^{N}\sum_{k=1}^{K}\omega_{ik} d(g_i, h_k),$$

wherein weights $\omega_{i,k}$ imposed on the element distances $d(g_i, h_k)$, are chosen so that the overall distance $D_M(G,H)$ is minimized [and], subject to

$$\omega_{ik} \ge 0,\ 1 \le i \le N,\ 1 \le k \le K$$

$$\sum_{i=1}^{N}\omega_{ik} = \gamma_k,\ 1 \le k \le K, \text{ and}$$

$$\sum_{k=1}^{K}\omega_{ik} = \mu_i,\ 1 \le i \le N.$$

14. The method according to claim 13 wherein at least one of said first and second mixture probability distribution functions includes a Gaussian Mixture Model.

15. The method according to claim 13 wherein the element distance between the first and second probability distance functions includes Kullback Leibler Distance.

16. The method of claim 13 wherein the first and second probability distribution functions are Gaussian mixture models derived from audio segments.